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ABSTRACT

Research and evaluation are crucial elements of the curriculum development process. Educational research properly includes "basic- nonevaluative" and "applied-evaluative research." Each species should be judged relative to its purpose and the degree to which systematic investigation occurs through the application of the scientific method. Evaluative or nonevaluative research must be justified in terms of the comprehensiveness of the knowledge base related to the project's development goals. Some overlap of research purposes between evaluative and nonevaluative research may occur with the improvement of evaluative research methodology. Relevancy to practical concerns may be improved by exploiting the mutual interdependence between evaluative and nonevaluative research. Practicing researchers must recognize the inherent differences of purpose between evaluative and nonevaluative research, and support each according to its particular strengths, if the full potential of the total educational research enterprise is to be realized. The I Can Project, an instructional program in physical education for trainable, mentally retarded, elementary school children, is presented as an example of the relationship between evaluative research and curriculum development. (Author/SE)

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RESEARCH AND EVALUATION IN CURRICULUM DEVELOPMENT

A PAPER PREPARED FOR PRESENTATION AT THE
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PART I

OVERVIEW OF THE I CAN CURRICULUM DEVELOPMENT EFFORT

Introduction

The focus of the I CAN Project[1] was to develop a set of instructional physical education materials for elementary age trainable mentally impaired children. The general aim was to develop a replicable form of instruction upon which a broad motor skill base and functional competence in selected games, sports and activities of the culture, could be built. These skills, along with companion cognitive and affective learnings, are perceived to be enabling to I CAN's overall goal of socio-leisure competence.

The general approach to the development of I CAN was guided by the considerations that the instructional materials were to be: 1) adaptable to the wide range of educational settings within which trainable mentally impaired children are found, 2) objective oriented, 3) diagnostic and prescriptive, and 4) designed to operationalize the concept of educational accountability.

A further consideration was that these materials should not represent a sequenced set of lessons but rather a resource from which local school districts/teachers could build programs more closely aligned with their unique objectives and resources. Concomitant with the resource material idea was the requirement that a procedural model be developed to guide the program's implementation. This model takes the form of a teacher's manual that systematically guides a series of decisions, based upon local conditions, resulting in a unique and functional implementation plan.

The Development of I CAN

There is a wide gap between the knowledge base, which relates to man and activity, and the teaching of physical education in the public schools (Vogel, 1969). This gap can be attributed largely to the failure of curriculum development efforts to use the concept of educational engineering[2] in developing

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[1] The I CAN Project is the popular name of the PROGRAMMATIC RESEARCH PROJECT in Physical Education for the Handicapped Child, Janet A. Wessel, Ph.D., Michigan State University, Project Director.

[2] See: Anderson, 1961; Cookingham, 1970; Gephart, 1970; Hamreus, 1969; and Mackie, 1967 for a discussion of the importance of this concept in curriculum development.

their instruction materials. The gap between the knowledge base and the teaching of physical education to the trainable mentally impaired is even more acute. For this reason, the I CAN Project focus became one of systematically converting this knowledge base into a program which could be implemented in the schools. This developmental approach can only be justified in situations where a large knowledge base is available, and only when evaluative research, as treated later in this paper, is an integral part of the development effort.

The evidence presented by the authors of footnote number 2, overwhelmingly supports the need for intermediary stages in the research to practice effort as it relates to the improvement of instruction. The conversion of knowledge into practice, including the intermediary stages, can be summarized in the following six steps:

1. Goal Identification and Objective Specification
2. Description of Instructional Design Specifications
3. Development of the Instructional Prototype
4. Evaluation of the Prototype
5. Modification of the Prototype
6. Recycling

Each of these steps is further explicated in Part II of this paper.

Rationale for Materials Development Approach

The knowledge base related to activity and man is rich with information in growth and development, weight control, motor skill learning and performance maintenance and improvement. Since most of this information is not utilized in current programs for the trainable, the approach to materials development was to: 1) use what is known in the subject field, 2) apply the newer procedures suggested for instructional design, which are briefly described in Part II of this paper, and 3) generate a product consistent with the general specifications described in the introduction. As will be discussed later, this decision placed the research effort at the "applied" level in the form of evaluative research. This decision is more clearly supported in the treatment of research, evaluation and curriculum development in Part II of the paper.

PART II

RESEARCH AND EVALUATION IN CURRICULUM DEVELOPMENT

Introduction

The following paragraphs attempt to portray the interrelationships that exist between "research" and "evaluation" within the context of curriculum development. The various types and characteristics of educational research are used in a discussion of the specific contributions and limitations of research in improving the educational program at the classroom level. A position statement is offered as a summary of the important interrelationships which must be recognized if optimum progress in educational research is to occur.

The Concept of Educational Research

The term "research" has been used to describe many forms of activity ranging from reviewing the literature through the rigorous form of laboratory application of the scientific method. Modifiers which are commonly associated with research activity include: experimental, basic, pure, historical, descriptive, applied, library, evaluative, action, philosophical, cooperative, survey, etc. Admittedly, there is redundancy within the narrow terms listed above. However, each in its own context is used as a functional descriptor in the application of the scientific method to approach and solve issues of concern to the educator. It is this common denominator, "application of the scientific method", which should be used in judging any species of the more generic term, "research", with respect to its position in the scientific community.

Evaluation, like research, has taken on many different meanings in recent years. Uses of the term range from the subjective judgments made with or without supportive data, through very sophisticated summative efforts which are similar in their precisions to controlled laboratory studies. Although evaluation, as in the previous summative characterization, may be correctly termed a species of research, this is not, and should not, always be the case. Rather the generic term, "evaluation" concerns the act of making a judgment of worth in comparison with some defined standard. Such a judgment can be made completely in the absence of the systematic investigation which is generally associated with research

activities. Evaluative research, as characterized in the following paragraphs, is an appropriate term for application of the scientific method in evaluating some educational product and represents a form of the "applied" species of research.

Types of Educational Research

Research types are commonly dichotomized into basic and applied, each species connoting "goodness" or "badness" depending upon one's orientation or training. Using the criterion of systematic investigation through application of the scientific method, both should be considered appropriate forms of research. "Goodness" and "badness" become appropriate only as descriptors of the degree to which implementation was: 1) consistent with the stated purpose, and 2) a rigorous application of the scientific method within contextual constraints.

Since this paper considers research, evaluation and curriculum development, the terms evaluative research and non-evaluative research will be used. Evaluative research will be characterized as a form of applied research and non-evaluative research will be used as a descriptor for those species of research commonly termed basic, pure or laboratory. Briefly defined, non-evaluative research refers to those forms of inquiry which have as their major purpose the expansion of theory through hypothesis testing and involve carefully controlled designs to obtain generalizable results. Evaluative research holds as its major purpose generating data for descriptive and judgmental uses which are not necessarily conclusive or generalizable.

Characteristics of Evaluative and Non-Evaluative Research

The overriding characteristic of sound educational research should be considered to be systematic investigation through the application of the scientific method. There are, however, different characteristics within the various species of research which should be noted. In Figure 1 below educational research is portrayed according to its two types: evaluative and non-evaluative. Contrasting characteristics are presented according to several important categories. (Note: Characterizations such as those suggested below are necessarily an over-simplification and should be interpreted within this constraint.

EDUCATIONAL RESEARCH CHARACTERISTICS

	RESEARCH TYPE	
	Non-Evaluative "Basic"	Evaluative "Applied"
Category	"Typical" Characteristics	
Goal	Knowledge generation (hypotheses-theory-laws)	Testing the application of knowledge
Objectives	Increased understanding regardless of value for social change	Information for program planning, development or operation
Generalizability	High generalizability	Low generalizability - Data for description and judgment
Control	Control over all but independent variables	Limited control over intervening variables
Variables	Abstract - the concept is the variable of interest	Concrete - the observable phenomena is the variable of interest
Utilization	Future and/or immediate	Immediate
Timelessness	Generalizable across time	Time specific
Design Validity	High internal validity Low external validity	Low internal validity High external validity
Investigative Technique	Application of the scientific method	

Figure 1. Educational Research Characteristics

CURRICULUM DEVELOPMENT

Introduction

The term curriculum development has commonly been used to describe those activities which convert theory into practice. Although research-to-practice appears to be a reasonable transition it is quite impractical without intermediary steps. As one might suspect, there is no one-to-one correspondence between laboratory

phenomena (with all their necessary controls) and classroom phenomena (with their characteristic lack of controls) (Cookingham, 1970; Twelker, 1969; Mackie and Christensen, 1967). Recent thinking in curriculum development has advanced the concept of the educational engineer or architect (Melton, 1959; Taba, 1962; Guba, 1965; Anderson, 1961; Gephart, 1970; Cookingham, 1970). As characterized by Figure 2, one could represent this common practice by portraying a wide canyon. On the one side is a large knowledge base in the form of substantiated hypotheses, theories and laws, and across the canyon educational practice is portrayed. Success at crossing such a gap without some sort of "bridge" must be considered quite remote (Ausubel, 1953; Cookingham, 1970; Gephart, 1970; Mackie, 1967). With the aid of the engineer, however, it becomes a matter of using the knowledge base to generate a set of specifications for building a bridge, constructing the bridge, and then evaluating its utility. Such an undertaking is descriptive of the modern curriculum development process (Twelker, 1969; Hamreus, 1969; Davis, 1972; Cookingham, 1970).

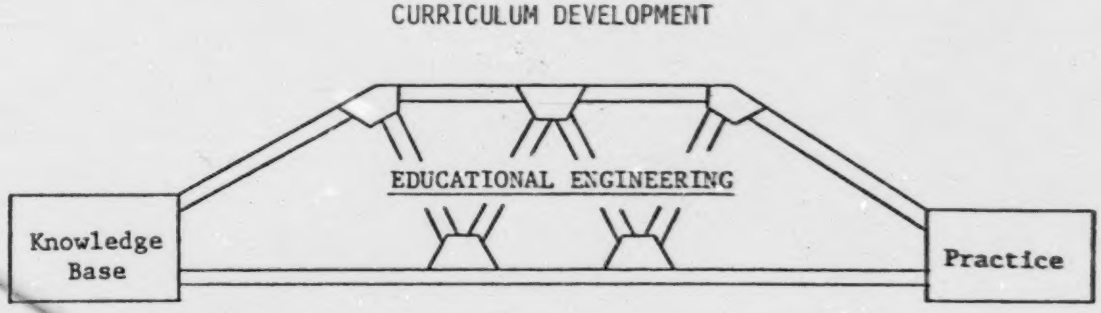

Figure 2. Educational Engineering Portrayed as a Bridge Between the Knowledge Base and Instructional Practice

The Curriculum Development Process

As suggested above the process of curriculum development must extend beyond the two stages: research-to-practice. A comprehensive model of curriculum development will address each of the following steps:

1. Goal Identification and Objective Specification
2. Description of Instructional Design Specifications
3. Development of Instructional Prototypes
4. Evaluation of the Prototypes
5. Modification of the Prototypes
6. Recycling

Goal Identification and Objective Specification is a social process conditioned by political and economic constraints which defines the purpose for which the instructional program is being developed (Hamreus, 1969). It identifies what is to be taught and reflects both the needs and values of society. Procedural considerations used to insure relevancy of purpose include library, survey, and descriptive research and task description and task analysis.

The Description of Instructional Design Specifications is a task of the educational engineer (Twelker, 1969). He must look at the goal(s) of the program, extract the related hypotheses, theory and laws from the knowledge base and propose a blueprint which guides the development of the instructional prototype. It is at this stage that non-evaluative, or basic, research is most closely related to the curriculum development process.

Twelker further divides instructional specification into two major divisions: 1) specifying the instructional sequence and 2) specifying the instructional conditions. Briggs (1968) suggests that sequencing is a more powerful influence in determining performance levels than how the competencies are taught. Further, there is support for the hypothesis that mastery of lower order objectives positively influences learning of higher order objectives (Gagne, 1965, 1962; Gagne, et. al., 1962; and Gagne and Paradise, 1961). Specifying instructional conditions combines a systematic use of the knowledge base with experience and "artfullness", plus the considerations of learner characteristics, instructional context, stimulus situations, learner responses and feedback situations (Twelker, 1969). It would be most desirable if the suggested mix of knowledge, art and experience were primarily dependent on the knowledge base; however, many gaps exist, causing experience and art to play major roles in the generation of instructional specifications. From the standpoint of curriculum development, the existence of these gaps should be considered as strong rationale for the inclusion of "basic" or non-evaluative research in the total educational research effort.

Development of the Instructional Prototypes involves the act of systematically following the instructional specifications to produce the substance, form and order of the instructional materials. It involves the process of translating a set of written statements (specifications) into an instructional product. However, clarity and completeness of instructional specifications do not guarantee a quality product. Of equal importance are the difficult decisions concerning conditions, stimuli, format, strategies, etc., which require the abilities of talented developers.

When complete, these decisions will, to a degree, reflect the accurate organization of the design specifications and the knowledge base from which they originated. Since the curriculum prototype is necessarily removed from its underlying knowledge base, a try out, built into the development process, becomes a necessary step for quality control. No matter how sophisticated the developmental process, developers have learned to expect about 60% effectiveness during the first implementation effort (Sorenson, 1970).

The primary concern during evaluation of the prototype is to determine, in a systematic fashion, the weakness or deficiencies of the curriculum product. Since this process is formative, implying modification, evaluators must be concerned not only with what is deficient, but also why (Hastings, 1966). The process of formative evaluation is the suggested methodology (Scriven, 1967; Cronbach, 1963; Sorenson, 1971; Alkin, 1970; Stake, 1967). Concerns of relevancy, feasibility and usability, as well as effect, are appropriate areas of investigation. Small sample, cyclical studies which examine various elements of the program and are conducted within the context of intended use should proceed broader field tests (Hamreus, 1969).

The appropriate standards for judging a program's effectiveness have been a point of disagreement in the field of evaluation. Cronbach (1963) favors comprehensive description and Scriven (1967) demands comparison. In the case of the formative evaluation of prototype materials, Hamreus (1969) clarifies the issue:

> "When a new system has been sufficiently developed and defined and in use over a period of time such that its accomplishments can be predicted, then comparative analysis with another established system are appropriate. When the system is still new and essentially unified the only basis for judgment lies in how well it attains the objectives for which it was created [p. 22]."

Evaluation of an instructional prototype moves from informal, judgmental procedures toward more formal, evaluative research methodologies during the field test. Its relation to theory is primarily one of hypothesis generating and can only provide support for theory building in unusual situations where tightly controlled designs are possible.

The Modification of Prototype Materials should be executed on the strongest data base possible. Generally speaking, all recorded deficiencies should be supplemented with alternative suggestions accompanied by rationale that explain

why they may be improvements. Revision criteria should be established and applied to each suggested change. Judgments must be made regarding whether or not the suggested modification is consistent with the original instructional specifications. In instances where inconsistency is apparent, both the suggested change and the instructional specification should be reviewed for inaccuracies.

Recycling represents the final stage of curriculum development, and is initiated for all or part of each instructional product based on whether or not the stated objectives are attained.

It should be noted that each of the curriculum development steps is not a discrete process but rather one of overlapping complexities. It is important, however, that such steps be clearly in mind if curriculum development is to occur as a systematic conversion of the knowledge base into instructional practice.

RESEARCH AND EVALUATION IN CURRICULUM DEVELOPMENT - A POSITION STATEMENT

Need for Both Evaluative and Non-Evaluative Research

The proceding paragraphs suggest the need for both non-evaluative and evaluative educational research in the curriculum development process. Non-evaluative research, characterized by its focus on hypothesis testing, theory expansion, generalizability, high internal validity and timelessness results in products which can be utilized by educational engineers for developing the specifications from which educational programs can be developed. Evaluative research, characterized by high external validity, low generalizability, information for decision making, immediate utility, time specificity and hypothesis generation is defined as an integral part of the curriculum development process.

Even though both evaluative and non-evaluative forms of research are important to curriculum development, the developer must be able to justify the degree to which he engages in each. In those instances where a large knowledge base exists, there appears to be less justification for the conduct of non-evaluative research within project activities. Rather, emphasis should be on the curriculum development process, which includes generous amounts of evaluative research activity, as a means of quickly incorporating that which is known into the realm of educational

practice. When the knowledge base is shallow, forcing many tenuous assumptions at the instructional specification level and where sufficient time and resources are available, non-evaluative or laboratory type research efforts may be easily justified. Curriculum development is a long, difficult and expensive task which can be conducted quite independent of sound assumptions or prudent instructional specifications. However, effort expended in developing a curriculum will not correct basic errors in design fashioned from faculty assumptions.

The Need for Cooperation Between Evaluative and Non-Evaluative Researchers

As one studies the characteristics of evaluative and non-evaluative research portrayed in Figure 1, it becomes quite aparent that researchers in both areas must put aside their allegations of goodness and badness, based on the type of research conducted. Characteristic comments of, "no control" or "too general" leveled at applied research and, "too sterile" or "unrealistic" leveled at basic research are entirely inappropriate within the broader context of educational research. The need for systematic investigation within the species of research must be used as the criterion denoting quality rather than the purpose and constraints within which the research type is conducted.

Perhaps further justification for acknowledging the importance of each type of research is their mutual dependence for elevating both the relevancy of basic research and the quality of educational practice. In this age of "tight monies" and practical priorities the mere fact that a curriculum development act has been funded is an indication of need or relevancy. Evaluative research, inherent in good curriculum development, becomes a rich source of relevant hypothesis which should be investigated within the context of tightly controlled, non-evaluative research.

As evaluative research methodology improves, it seems entirely possible that its goals may be expanded to include the provision of data to support theory-related hypotheses. Through what Rosenshine (1972) refers to as monitoring the degree to which the instructional product is implemented as intended, information concerning the why of identified effects may be analyzed through evaluative research. Variables of interest could extend beyond the traditional antecedent and transaction variables described by Stake (1967) (although these are highly relevant) to ones related to the instructional specifications used in step two of

the curriculum development process. Depending on the degree to which certain theoretical premises are operationalized in the instructional product and applied in the instructional setting (described by the monitoring process), one could test their effects in a more externally valid manner. Information of this type could be particularly helpful if such experiments were replicated with the systematic varying of interveing variables.

Summary

Research and evaluation are crucial elements of the curriculum development process. Educational research properly includes "basic - non-evaluative" and "applied - evaluative research". Each species of research should be judged relative to its purpose and the degree to which systematic investigation occurs through the application of the scientific method. Evaluative or non-evaluative research, as a legitimate curriculum development project activity, must be justified in terms of the comprehensiveness of the knowledge base related to the project's development goals. Some overlap of research purposes between evaluative and non-evaluative research may occur with the improvement of evaluative research methodology. Relevancy to practical concerns may be improved by exploiting the mutual interdependence between evaluative and non-evaluative research. Practicing researchers must recognize the inherent differences of purpose between evaluative and non-evaluative research, and support each according to its particular strengths, if the full potential of the total educational research enterprise is to be realized.

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